APPLICATION NOTE

SAA7710T Dolby Pro-Logic Plug-In Module Kit for TDA9875 Digital TV Sound Processor Demonstration Board (Version 1.1)

AN96115

Philips
Semiconductors

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Abstract

A simple plug-in module for the TDA9875 demonstration board has been developed at Philips Semiconductors Systems Laboratory Southampton (PS-SLS). Based on the SAA7710T IC, the module adds Dolby Pro-Logic Surround Sound decoding facilities to this Digital TV Sound Processor.

The module kit, and its method of use, are outlined.

Purchase of Philips I^2C components conveys a license under the Philips I^2C patent to use the components in the I^2C system, provided the system conforms to the I^2C specifications defined by Philips.

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Summary

A SAA7710T Dolby Pro-Logic Surround Sound DSP Core Plug-in Module Kit for the TDA9875 Digital TV Sound Processor Demonstration Board has been built, and it demonstrates how simple it is to interface the SAA7710T to the TDA9875.

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1 INTRODUCTION

A cost effective solution for Dolby Pro-Logic Surround Sound in a TV, or a set-top box, can be implemented using the Dolby Pro-Logic Surround Sound DSP Core IC SAA7710T and the TDA9875 Digital TV Sound Processor IC. To demonstrate how simple it is to interface the SAA7710T with the TDA9875, Philips Semiconductors Systems Laboratory Southampton (PS-SLS) has built an SAA7710T Plug-in Module Kit, to be used with the Digital TV Sound Processor TDA9875 Demonstration Board from Philips Semiconductors Systems Laboratory Hamburg (PS-SLH).

This version of the board (Version 1.1, PCAL5193-1 PCB), omits provision for unnecessary connectors included in Version 1.0, PCAL5193-0 PCB.

2 CONTENTS OF KIT

- SAA7710T plug-in module, PCB number: PCAL5193-1 (see Figure 1 on Page 11 and Figure 2 on Page 12).
- I^2C Cable for PC.
- SMB Lead (approximately 10 cm).

3 ADDITIONAL REQUIREMENTS (NOT SUPPLIED)

- The TDA9875 demonstration board, PCB number: H5ACS23 (or its successor), from PS-SLH.
- The demonstration software for TDA9875 demonstration board, from PS-SLH.
- The demonstration software for SAA7710T evaluation kit, from Philips Semiconductors Nijmegen.

It is assumed that the user is familiar with the operation of all of the above.

4 PRINCIPLE OF OPERATION

The simplified block diagram for the SAA7710T and TDA9875 is shown in Figure 3 on Page 12.

The digitised left and right signals are fed from the TDA9875 I^2S output port 1 to the SAA7710T I^2S input port 1, which returns Dolby processed left and right signals, plus centre and surround signals, to the TDA9875 I^2S input ports 1 and 2 respectively. These digital signals are converted by the four DACs in the TDA9875 to analogue left and right signals on its main output, plus centre and surround signals on its auxiliary output.

5 INSTALLATION NOTES

The interconnection set-up is shown in Figure 4 on Page 13.

The SAA7710T module (PCAL5193-1 PCB) plugs directly into sockets ST02, ST04 and ST05 of the TDA9875 demonstration board (H5ACS23 PCB or its successor) from PS-SLH. A clock connection is required from the SMB connector 'SYSCLK' on the TDA9875 board, to the SMB connector 'SMB1' on the SAA7710T board. A short SMB cable is provided for this purpose.

The kit is intended for use with a *single* PC running both the TDA9875 and the SAA7710T demonstration software. A special I^2C interface cable is provided which should connect the printer port of the PC to socket ST03 on the TDA9875 board (see Figure 5 on Page 14 for new cable make-up).

This cable is configured for the SAA7710T software. To make the TDA9875 software work with this cable its I^2C configuration must be set to 'hardwareless'.

The interface cable supplied does *not* support flag0/flag1 facilities in the SAA7710T debugger software. It contains only I^2C connections and not the extra flag wires.

The system utilises the auxiliary (headphone) outputs of the TDA9875 for the centre and surround channels. Connect the left and right outputs from socket ST13, and the centre and surround outputs from socket ST12 ('centre' to the 'left' channel), to your power amplifiers.

Connect a (Dolby Pro-Logic encoded) stereo signal source to the SCART 1 input, socket ST08, on the TDA9875 board. (SCART 2, or other input, may be used but modify the TDA9875 'ADC source' setting accordingly.)

There is no hardware reset switch on the SAA7710T board, but the reset pin of the IC is connected to port 2 of the TDA9875. Therefore the SAA7710T can be reset from the TDA9875 software by taking port 2 low and then high again.

6 INSTRUCTIONS TO GET STARTED

- Always apply power to the demonstration boards *after* switching on the PC to prevent damage to PC printer port.
- The 2 jumpers, JU01 and JU03 on the TDA9875 demo-board, should be fitted to provide +5 V supply to the SAA7710T plug-in module.

Run the TDA9875 software first and check the following:

- All relevant level controls may be set to 0 db, and the balance controls should be set centrally.
- In the Signal Paths dialogue box, check that the 'ADC in, Source' is set to 'Scart1 in' (or otherwise as appropriate).
- In the Features Interface dialogue box, check the following:
  - The 'IIS1 out, Source' is 'ADC', 'L, R'. (NB: take great care that this, and similar controls, are set to 'L,R'. By default they reset otherwise and this may in the Dolby system mute the left and right channels.)
  - The 'System Clock' is set to '512 x Fs' (=16.384 MHz).
    The 'Serial Audio' is set to 'IIS'.
- On the Main Screen check that:
  - The 'Loudspeaker Source' is set to 'IIS1', 'L,R'.
  - The 'Headphone Source' is set to 'IIS2', 'L,R'.
- Using the Sound IF dialogue box, reset the SAA7710 by taking TDA9875 port #2 low, and then high again. (NB: press 'OK' after each stage. Do not just select 'low' and then 'high', otherwise the 'low' will not have been sent.)

Leave the TDA9875 software running.

Run the SAA7710T demonstration software. (During this initialisation, the TDA9875 software may return with a I^2C message dialogue box, which asks if you want to suppress subsequent messages. Indicate 'Yes' and toggle back to the SAA7710T software.)

Check the following:

- All relevant level controls may be set to 0 dB.
- Input 1 is selected. (NB: this SAA7710T module does not support input 2.)
- The Decoder Main Mode is 'Full Dolby Pro Logic'.
- The Centre Channel Mode is 'Normal'.

Check for correct operation by running the noise generator.

NB: If there are unexpected results, check the relevant TDA9875 channel settings are all 'L, R'.

7 CONCLUSION

By utilising the four DACs of the TDA9875 for the Dolby processed L/R/C/S, Dolby Pro-Logic Surround Sound can be easily added to a TV, or a set-top box design using the SAA7710T.

8 REFERENCES

[1] SAA7710T DSP Core/Dolby Pro-Logic Surround/Dolby 3 Stereo, Tentative Specification, 17 November 1995.

[2] TDA9875 Digital TV Sound Processor, Objective Specification, 03 September 1996.

[3] SAA7710T Dolby Pro-Logic Evaluation Kit (Version 1.0), User Manual, Report number: NDA/UM95001, Product Development/Design & Application, Consumer ICs Nijmegen.

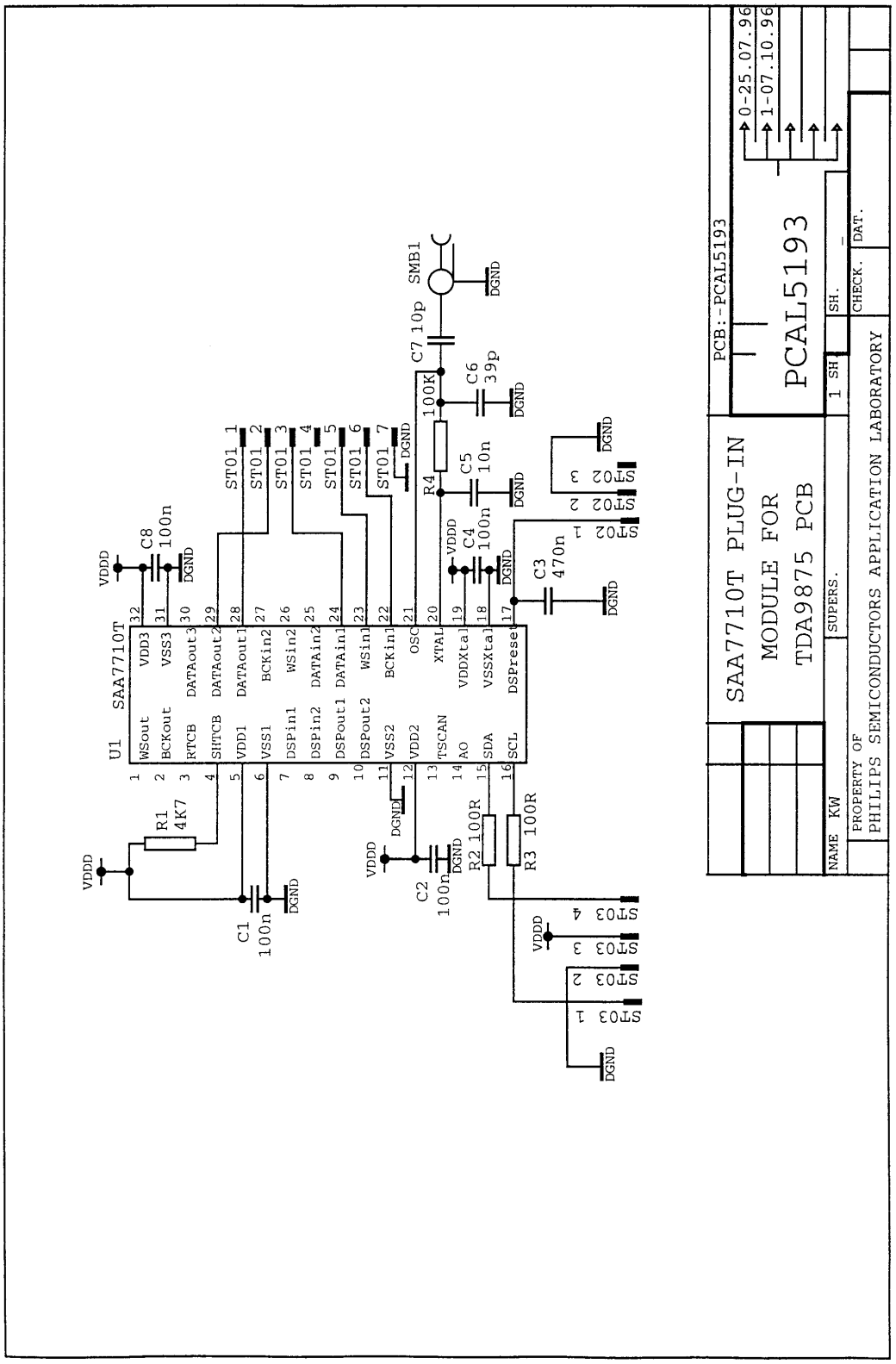
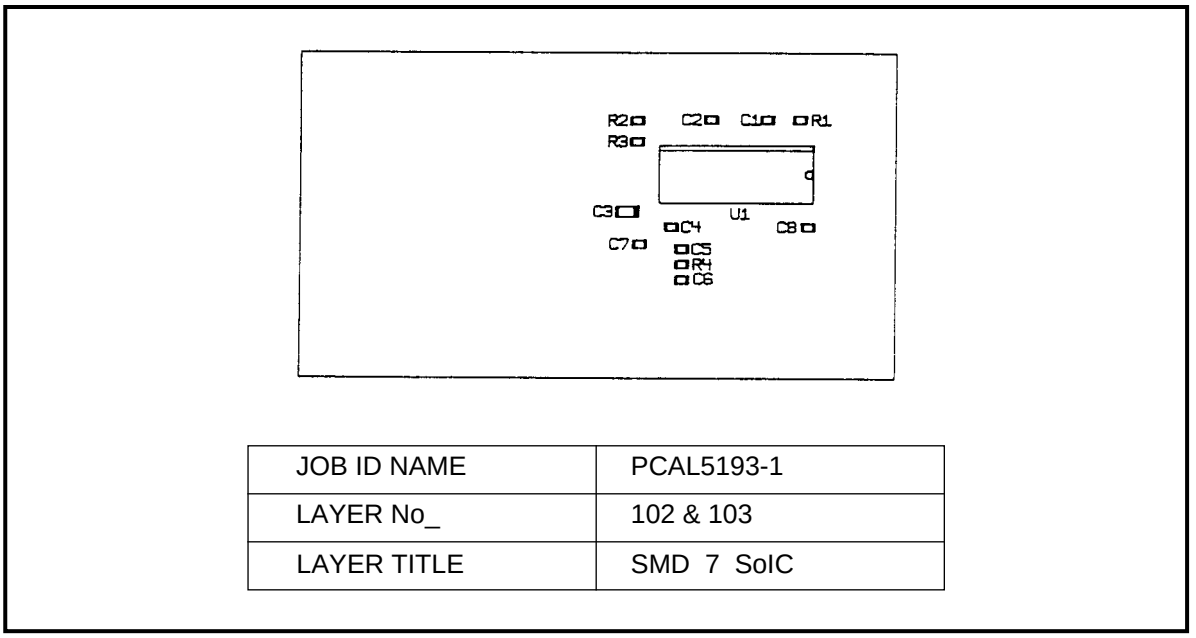


Figure 1 Schematic Diagram of the SAA7710T Plug-In Module



JOB ID NAME	PCAL5193-1
LAYER No_	102 & 103
LAYER TITLE	SMD 7 SoIC

Figure 2 PCB Lay-Out Component Side of the SAA7710T Plug-In Module

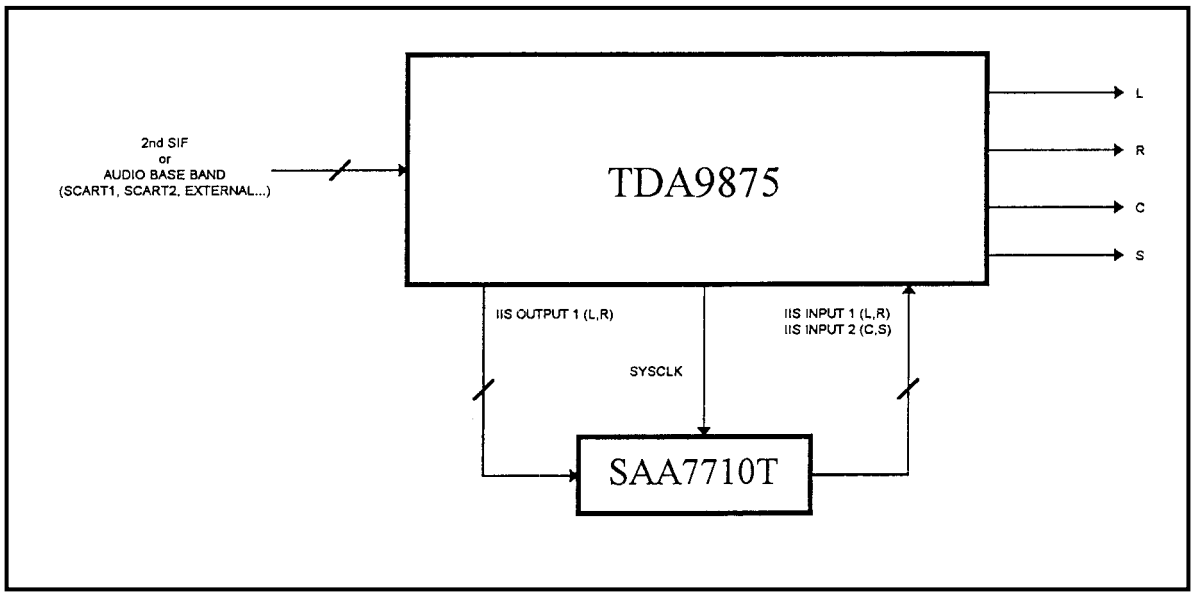


Figure 3 Simplified Block Diagram for SAA7710T and TDA9875

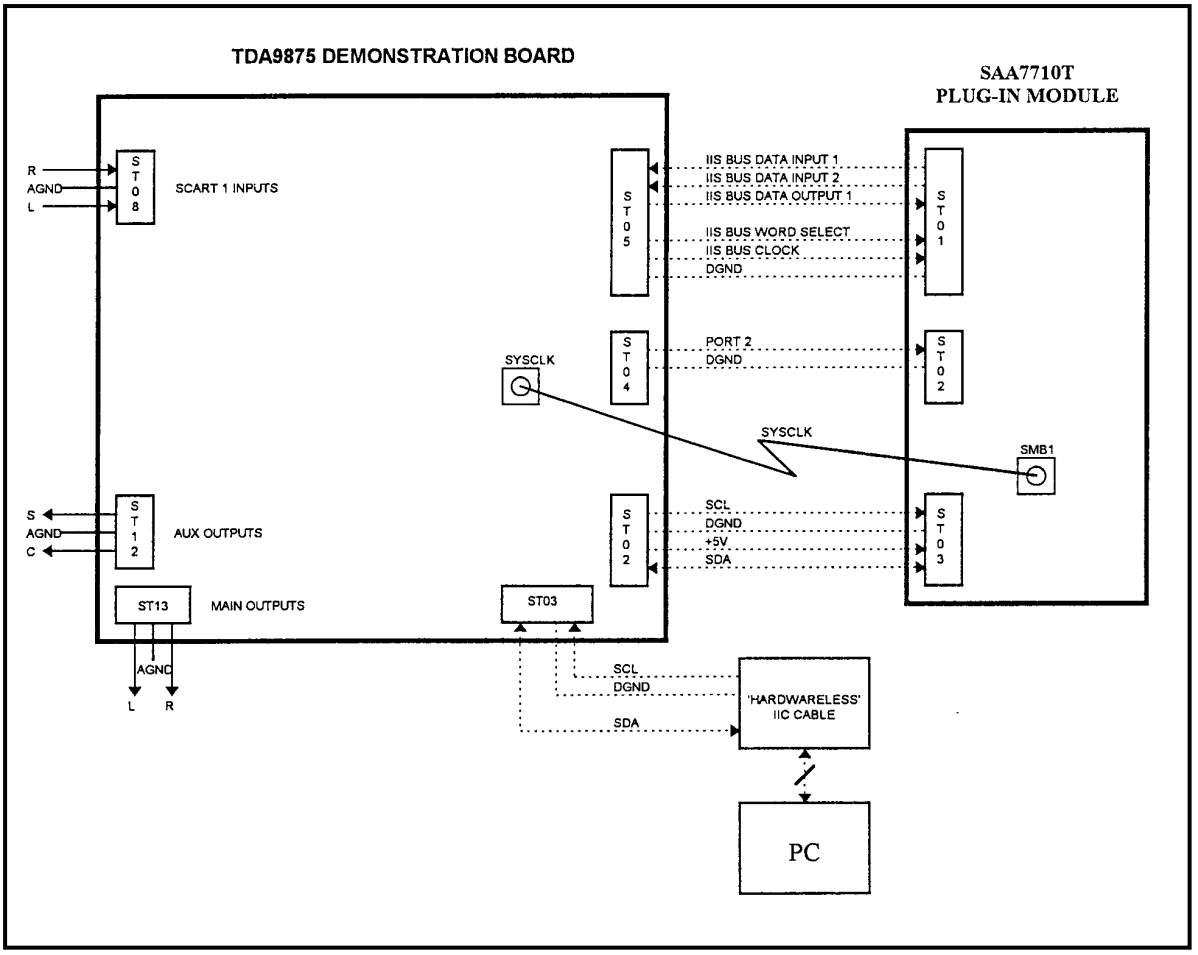


Figure 4 Interconnection Set-Up

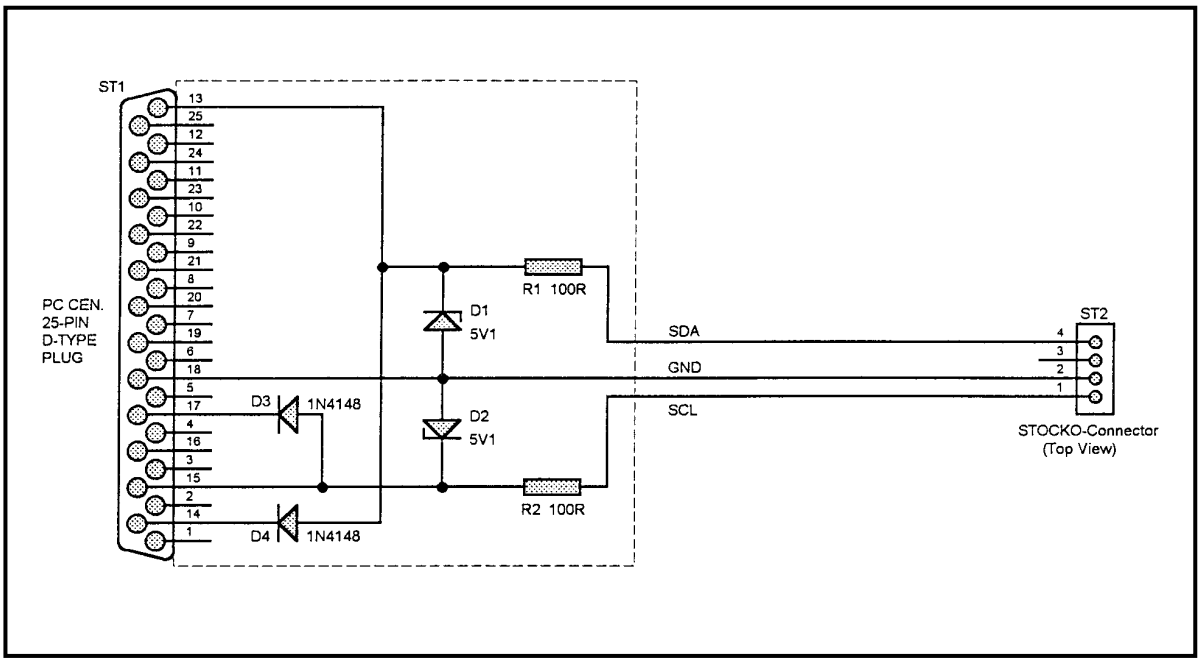


Figure 5 'Hardwareless' I^2C Cable Configuration

Table 1 Component List of the SAA7710T Plug-In Module

Component	Part Type	Value	Description
C1	0805	100n	SM Cap 100n 0805 X7R
C2	0805	100n	SM Cap 100n 0805 X7R
C3	1206	470n	SM Cap 470n 1206 X7R
C4	0805	100n	SM Cap 100n 0805 X7R
C5	0805	10n	SM Cap 10n 0805 X7R
C6	0805	39p	SM Cap 39p 0805 NPO
C7	0805	10p	SM Cap 10p 0805 NPO
C8	0805	100n	SM Cap 100n 0805 X7R
R1	RC-11	4k7	Philips SMT resistor 4k7 5% 0.1 W
R2	RC-11	100R	Philips SMT resistor 100R 5% 0.1 W
R3	RC-11	100R	Philips SMT resistor 100R 5% 0.1 W
R4	RC-11	100 k	Philips SMT resistor 100 k 5% 0.1 W
SMB1	SMB_SKT		Sub-min bayonet snap-on PC socket (m)
ST01	MKF19393		Connector 7 Way Stocko
ST02	MKF19394		Connector 3 Way Stocko
ST03	MKF19397		Connector 4 Way Stocko
U1	SAA7710T		Dolby Surround Pro-Logic Core

Table 2 Parts List of the SAA7710T Plug-In Module

Item	Code No:	Part Type	Description	Quantity
1	10017710	SAA7710T	Dolby Surround Pro-Logic Core	1 U1
2	20930101	RC-11	Philips SMT resistor 100R 5% 0.1 W	2 R2 R3
3	20930104	RC-11	Philips SMT resistor 100 k 5% 0.1 W	1 R4
4	20930472	RC-11	Philips SMT resistor 4k7 5% 0.1 W	1 R1
5	40890109	0805	SM Cap 10p 0805 NPO	1 C7
6	40890399	0805	SM Cap 39p 0805 NPO	1 C6
7	40897103	0805	SM Cap 10n 0805 X7R	1 C5
8	40897104	0805	SM Cap 100n 0805 X7R	4 C1 C2 C4 C8
9	40906474	1206	SM Cap 470n 1206 X7R	1 C3
10	81130010	SMB_SKT	Sub-min bayonet snap-on PC socket	1 SMB1
11	86162034	MKF19393	Connector 3 Way Stocko	1 ST02
12	86162044	MKF19394	Connector 4 Way Stocko	1 ST03
13	86162074	MKF19397	Connector 7 Way Stocko	1 ST01